

Earth, Atmospheric, and Planetary Sciences

Course 12

About 252 million years ago, approximately 90 percent of marine species and 70 percent of terrestrial species went extinct, the largest known mass extinction. Apparently synchronously, the largest volcanic eruptions in Earth's history occurred, in which about 6,000,000 cubic kilometers of magma erupted — enough to cover the continental U.S. almost a mile deep. Was the timing of these two events a coincidence, or did the volcanism cause the extinction? Can the study of this problem lead to insights about the links among atmosphere, ocean, and tectonic processes that will be useful for predicting Earth's future?

The energy demands of 2100 will require investigation of the environmental, technical, and economic barriers to current and new energy sources. The earth sciences can make important contributions to climate change, air and water quality, ecosystem disruption, and waste disposal.

Earth, atmospheric, and planetary sciences (EAPS) is a vigorous and dynamic discipline, uniting faculty and students in the quest to solve problems through the application of physics, chemistry, biology, and mathematics. With a department that is unusual in its breadth and depth, we are able to apply fundamental scientific principles across traditional borders, leading to rich interdisciplinary collaborations and programs of study.

EAPS at MIT

EAPS combines the excitement of a top-ranked research department with an accessible, collegial atmosphere. Undergraduates develop skills in quantifying and modeling natural systems in which longer time scales and larger space scales are principal considerations. The ability to analyze the behavior of these complex systems can be adapted to the study of problems in virtually any field.

Department collegiality is fostered by a variety of informal gatherings, from a daily cookie hour to the annual department field trip. EAPS provides

undergraduate majors with a common room in Building 54 where they can study, read, talk, or relax.

Undergraduate Program

The EAPS undergraduate program provides students with a challenging curriculum. The research areas in EAPS are inherently interdisciplinary, and our small class sizes encourage and enhance student-professor interactions. Students with strong undergraduate academic records are able to complete a Master's degree with one year of additional study.

The department's flexible academic program allows students to customize their program while including unifying experiences at both the start and end of the program of study. Each major will complete field or laboratory training in addition to theoretical work. All undergraduate majors must also complete a senior thesis as part of the degree requirements.

Common areas of study for EAPS majors are listed below.

- Environmental Science: study of the processes that link the components of the Earth system; consideration of the historic interaction of rocks, water, air, and life; human impact on the natural world.
- Geoscience: study of the solid earth; composition and chemistry; strength of materials; dynamics, deformation, and structure; geochronology; evolution of life and the earth system.
- Geobiology: study of the interaction of the atmosphere, rocks, water, and microbes to reconstruct ancient environments; understanding how life evolved within them; and gaining insight into oxygenic photosynthesis.
- Atmospheres and Oceans: study of the dynamics, chemistry, and interactions of the atmosphere and ocean; climate change; modeling the impact of biology on the chemistry of the ocean.
- Planetary Science: study of the physical,

chemical, and geological structure and evolution of solar system bodies; includes study of paleomagnetism.

- Planetary Astronomy: dynamical and chaotic evolution of planetary systems; near-earth bodies and asteroids; detection of extra-solar planets and their atmospheres.

The department offers three minor programs. The minor program in EAPS with specialization in geology, geophysics, planetary science, meteorology, or climatology complements planned degrees in engineering, biology, physics, urban studies, economics, or applied mathematics. These combinations provide excellent foundations for careers in applied science that touch on any area of earth science.

The minor program in Astronomy, offered jointly with the Department of Physics, covers the observational and theoretical foundations of astronomy.

EAPS also participates in the multi-disciplinary minor in Energy Studies. The minor enhances the depth of knowledge required for a major with a broad understanding of the science, technology, and social sciences topics related to energy and environmental issues.

Research

EAPS is eager to involve undergraduates in its research programs. Our students have ample opportunities to work alongside faculty conducting significant research in their area of interest, including laboratory and field data acquisition, data analysis, and numerical simulation. During any given semester, between 30 and 40 undergraduates participate in the Undergraduate Research Opportunities Program (UROP) through our department. To encourage excellence in undergraduate research, EAPS annually awards the Goetze Prize.

What Can I Do With a Degree in EAPS?

We prepare our undergraduate majors for advanced graduate work as well as for jobs in business and industry. Most of our majors pursue graduate school in the geophysical

sciences at top-tier institutions in their fields, including MIT, MIT/WHOI Joint Program, Brown University, Caltech, University of Michigan, Princeton, and Harvard University. Some recent undergraduates are working in the insurance industry doing risk assessment, trading energy futures for financial firms, serving as consultants, attending law school and medical school, and interning in Japan, Mexico, and Germany.

EAPS students who enter the private sector can anticipate competitive salaries. Salaries for all geoscience-related professions have exceeded the national mean salary for all other science occupations over the past 10 years. Between 2008 and 2009 the increase in geoscience salaries (3.1 percent) was more than the salary growth of other science occupations (2.1 percent) and all U.S. occupations (2.8 percent). Equally important, experienced geoscientists report a high level of job satisfaction.

Experience in the field, proficiency in the laboratory, and familiarity with complex computer modeling are all essential to success in the EAPS research and instructional programs — and serve all of our students well in their future careers.

Contact Information

For more information, please contact:
The Education Office, Department of Earth,
Atmospheric, and Planetary Sciences, MIT
77 Massachusetts Avenue, Room 54-911
Cambridge, MA 02139-4307
Phone: (617) 253-3381
Website: <http://eapsweb.mit.edu/>

The MIT Course Catalog contains further information on the Institute, including all graduate and undergraduate courses and programs. For details on ordering the course catalogue, please visit the MIT Press Bookstore website at <http://web.mit.edu/bookstore/www/bulletin.html>.